A Case Study of Concept Development for Service Quality Measurement in Aviation Industry Using Kano's Model

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Abstract: To develop a conceptual model of airport terminals, this study investigates the pre-flight phase and post-flight phase services at airport terminals to contribute to the development of a conceptual model to improve airport service quality. A literature review on service quality measurement (SQM) and aviation regulation was used with a case study and focus group interviews. The case study in the pre-flight and post-flight phases regarding airport terminal service sought to identify factors that influence service quality in the aviation industry and passengers' perceptions of an airport's image. Aviation regulation criteria were studied, and Kano's model was used to integrate improved service quality to enhance an airport's image. Kano's model for airport terminal service measurement was proposed to find the satisfaction index (SI) and dissatisfaction index (DI) of airline passengers concerned with airport terminal services. The qualitative exploration of the airport terminal service experience from the airline passengers' perspective was combined with a review of the relevant literature in order to identify the variables, to clarify the basic concepts, and to generate a conceptual model of airport terminal service quality expectations. The extended service quality level provides comprehensive service management in the aviation industry to meet passenger expectations and improve image. The newly developed model and the airline and airport case examples are discussed.

Key words: Kano's model; airport/airline service; service quality; passengers' perception

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1. Introduction

Airports play a significant role as hubs for transportation networks and support overall businesses, market forces, and social service. To improve serviceability, airports need to develop innovative processes to generate more commercial revenue. Airport service quality plays a significant role in air transportation, directly and indirectly affects customers and economic growth, and contributes to customers' quality of life by enabling the movement of people and products all over the globe quickly and safely. If airport terminal service is improved, it will also improve airline service quality and enhance the image.

A conceptual model of airport service quality can be developed by conducting an empirical investigation into airline passengers' perception. An airport terminal service process should be developed for the evaluation of service quality to improve the aviation industry's services. An empirical investigation into airline passengers'

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perception can contribute to the development of a conceptual model of airport service quality during the pre-flight and post-flight phases. Therefore, this research was conducted in order to develop a scale to measure airline passengers' expectations of airport terminal service quality during the pre-flight and post-flight phases (Park et al., 2005). Management teams can use the developed airport terminal service quality framework to evaluate their airport terminal services to meet passengers' expectations.

2. Literature Review

The term 'service quality' has been used to establish criteria that are important to assess service quality through customer evaluations. The competitive advantages in offering superior service quality include an airline leading the market share (Chien et al., 2010). Efforts to increase adherence to aviation service quality should be prioritised (ICAO, 2015) to improve an airline's image.

2.1 Service Quality Measurement (SQM)

Service characteristics cannot be produced in advance, so service quality must exceed customers' expectations and outcomes to improve service quality (Barbara R and Lewis, 1993). The variety of service quality definitions, formulations from customers' perspectives, and perceptions are important dimensions of SQM. According to Gronross (1982), service quality is the level needed to meet customers' expectations. Improvements in service quality can increase both profits and the customer base through new and repeat purchases from loyal customers (Gilbert and Wong 2002). Customer satisfaction influences loyalty; therefore, growth and maximised profitability are primarily stimulated by customer loyalty (Heskett et al. 1994).

2.2 Airport Terminal Service Criteria During the Pre-flight and Post-flight Phases

One of the airport terminal services during the pre-flight and post-flight phases involves facilities for passenger and baggage transfer. The airport operational effectiveness in the use of gates, parking area and ground handling resources functional effectiveness are reflect the service quality. In terms of airlines, an airline's customer relationship management (airline CRM) initiatives typically focus on frequent-flyer programmes and narrow up-sell and cross-sell features in various flight classes. Service quality in the aviation industry is complex and differs from other service industries. According to the airline industry's service process, service items are defined by the International Air Transportation Association (IATA) and include reservation seating capacity, ticketing, check-in processes, in-flight services, baggage handling, and post-flight services (Feng and Jeng, 2005).

Airports have a significant opportunity to build an integrated, high-value experience for passengers from reservation to pre-flight and travelling in-flight and through the post-flight at the airport. Both airport and airline roles, service quality models evolve passengers have an increased expectation for personalised services. These should be tied to a reward system built on combined airport and airline spending, not just airline spending. A superior, integrated passenger experience will become the key differentiator for both airlines and airports, improving passenger experience and, consequently, passenger loyalty. Table 1 presents a summary of airport terminal service process criteria to be evaluated during the pre-flight and post-flight phases, and the criteria are coded as PC1-4 for check-in service code, PB1-6 for boarding service code and criteria, and PO1-5 for baggage and transit service code and criteria.

Table 1   Summary of Airport Terminal Service Process Criteria in the Pre-flight and Post-flight Phases

Pre-flight at airport	
Check-in service code and criteria	**Boarding service code and criteria**
PC1: Convenient check-in	PB1: Comfortable waiting area
PC2: Quick baggage processing	PB2: Prompt response to passengers
PC3: Comfortable check-in area	PB3: Facility support for on-time boarding
PC4: Employee knowledge and courtesy	PB4: Accurate flight information
	PB5: Employees willing to help passengers
	PB6: Availability of passengers' preferred seating
Post-flight at airport	
Baggage and transit service code and criteria	
PO1: Quick baggage delivery	
PO2: Lost-and-found service	
PO3: Convenient baggage claim	
PO4: Promptness and accuracy of facility	
PO5: Modernised baggage handling and transferring system	

2.3 Kano's Attractive Quality Theory and the Customer Satisfaction Coefficient

According to Kano et al. (1984), the model development in figure 1 identify core customer requirements of product and service improvements by examining the non-linear relationship between service performance and customer satisfaction (Ankur et al., 2010). Thence Kano's model has been studied with the airport terminal service measurement, the tools include cluster analysis with the focus group interview in airport terminal service at pre-flight and post flight criteria for the qualitative research.

According to Matzler et al. (1998) and as shown in Figure 1, attractive quality separates Kano's service requirements into Must-be (M), One-dimension (O), Attractive (A), Indifferent (I), and Reverse (R). The customer satisfaction coefficient (CS) is the qualitative value of customer satisfaction and dissatisfaction. Kano's model and the CS formula are applied to indicate the qualitative values of the customer satisfaction index (SI) (Ankur et al. 2010; Berger et al. 1993), as shown in Table 2.
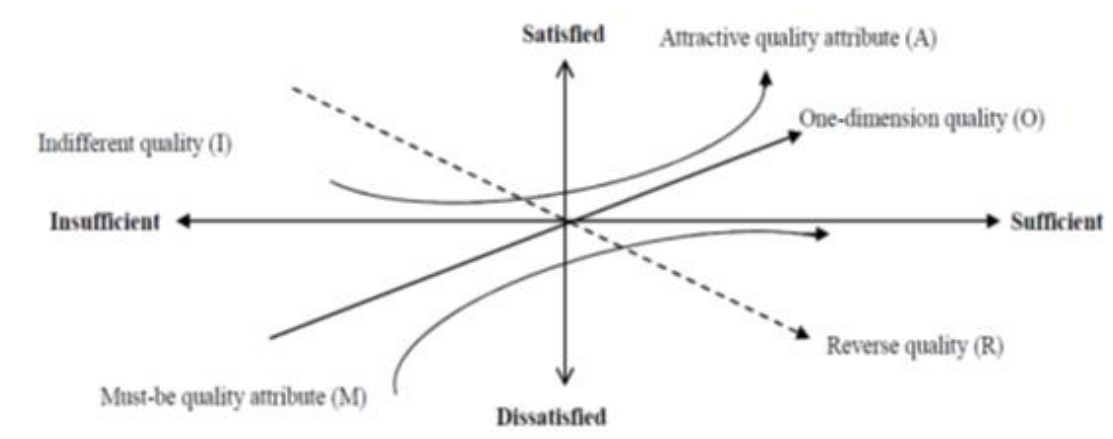
Figure 1   Kano's Excitement and Basic Quality Model, Adapted from Matzler et al. (1998)

Table 2   Umary of Kano's Mdel and the Customer Satisfaction Coefficient Formula

Requirements	Meets product or service requirement
Must-be quality (M)	The customer becomes very dissatisfied if this requirement is not met, but if sufficient it will not result in more satisfaction.
One-dimension quality (O)	The higher the performance, the greater the improvement in customer satisfaction.
Attractive quality (A)	Absence does not cause dissatisfaction but will fulfil the customer requirement and lead to more customer satisfaction.
Indifferent quality (I)	The customer is not very interested, whether it is present or not.
Reverse quality (R)	The customer has no desires and expects the reverse.

2.4 Kano's Model Applied to Airport Terminal Service Criteria in the Pe-flight and Pst-flight Pases
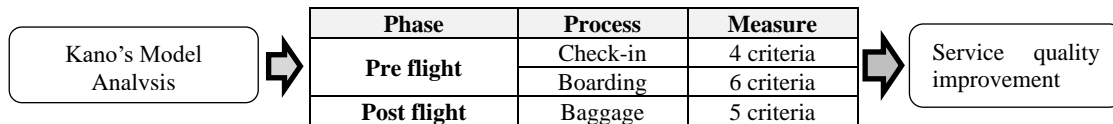
Airport terminal service criteria in the pre-flight and post-flight phases were categorised according to Table 1. These airport terminal service process criteria to be evaluated during the pre-flight and post-flight phases and each criterion were coded. Check-in service in the pre-flight phase includes criteria codes PC1-C4: convenient check-in (PC1), quick baggage processing (PC2), comfortable check-in area (PC3), and employee knowledge and courtesy (PC4). Boarding service in the pre-flight phase includes criteria codes PB1–PB6: comfortable waiting area (PB1), prompt response to passengers (PB2), facility support for on-time boarding (PB3), accurate flight information (PB4), employees willing to help passengers (PB5), and availability of passengers' preferred seating (PB6). In the post-flight phase, baggage and transit service criteria were annualised and coded as follows: quick baggage delivery (PO1), lost-and-found service (PO2), convenient baggage claim (PO3), promptness and accuracy of facility (PO4), and convenience of transit or connecting flight service (PO5). Kano's models to identify the customer SI, which indicates overall passenger satisfaction (Jeeradist et al., 2016) is shown in Table 3.

Table 3   Umary of the Airport Terminal Service Criteria Measurements Obtained by Kano's Attractive Quality Model (Jeeradist et al., 2016)

Service quality measurement		Criteria	SQM code
Pre-flight at airport	Check-in service	Convenient check-in	PC1
		Quick baggage processing	PC2
		Comfortable check-in area	PC3
		Employee knowledge and courtesy	PC4
	Boarding service	Comfortable waiting area	PB1
		Prompt response to passengers	PB2
		Facility support for on-time boarding	PB3
		Accurate flight information	PB4
		Employees willing to help passengers	PB5
		Availability of passengers' preferred seating	PB6
Post-flight at airport	Baggage and transit service code and criteria	Quick baggage delivery	PO1
		Lost-and-found service	PO2
		Convenient baggage claim	PO3
		Promptness and accuracy of facility	PO4
		Modernised baggage handling and transferring system	PO5
Measurement formulas based on Kano's model			

$$\text{Satisfaction index (SI)} = \frac{A \pm O}{(A+O+M+I)}$$

$$\text{Dissatisfaction index (DI)} = \frac{M \pm O}{(A+O+M+I)}$$

3. Methodology

According to the literature review, the purpose of improving the airport terminal service and passengers' perceptions of airline service quality should be evaluated using airport terminal service criteria and Kano's models to improve airport service quality, as shown in Tables 1-3. The integrated model of airport terminal service criteria during the pre-flight and post-flight phases of airline operations using Kano's models was developed as follows:

Kano's Model Analysis	→	Phase	Process	Measure	→	Service quality improvement
		Pre flight	Check-in	4 criteria		
			Boarding	6 criteria		
		Post flight	Baggage	5 criteria		

Figure 2   Proposed Integrated Model of Airport Terminal Service Criteria During the Pre-flight and Post-flight of Airline Operations Phases Using Kano's Models

The proposed integrated model in Figure 2 was developed based on Kano's attractive model, including service process at the airport terminal during the pre-flight of departure and post-flight of arrival. The airport terminal service criteria in the pre-flight phase included four check-in criteria and six boarding criteria, and the post-flight phase included five baggage service criteria. Using Kano's models to analyse these criteria to survey the method of service improvement in each phase of study as defined by the IATA, we included items such as seat capacity, ticketing, check-in processes, baggage handling, and post-flight services (Feng & Jeng, 2005). Kano's models were integrated to determine the customer SI, which rates the overall passenger satisfaction level (Gronroos, 1982; Parasuraman et al., 1988).

3.1 Focus Group Questionnaire Development Process

The qualitative method and questionnaire were based on Kano's model, which includes attractive, one-dimension, must-be, and indifferent categories. We conducted focus groups and personal interviews, as well as direct or participatory observations of passengers and aviation industry employees. The questionnaire was developed using the steps of analysis (Walden et al., 1993).

The questionnaire was developed according to the process in Figure 3. Testing and review of Kano's model consisted of formulating pairs of questions on the service attributes for which feedback from airline passengers and employees was important. The questionnaire was constructed through pairs of passenger requirement questions. Consequently, each question has two parts, as shown in Table 4 (Berger et al., 1993; Kano et al., 1984; Walden et al., 1993).

Questionnaires development	↔	Test and Review	↔	Personnel interview	↔	Calculate	↔	Analysis of results	↔	Improvement

Figure 3   The Questionnaire Development Process as Adapted From Walden et al. (1993)

Then, perceptions were categorised into quality dimensions that were based on respondents' perceptions of the quality attribute's functional and dysfunctional forms. Examples of three potential customer requirements in the Kano questionnaire are shown in Table 4. Questions 1A, 2A, and 3A in each pair capture the respondent's feelings when an airport service possesses a certain attribute, while questions 1B, 2B, and 3B capture the respondent's feelings when an airport service does not provide that attribute. For each part of the question, the passenger selects one of five alternative answers, which are described as: 1 = I like it that way, 2 = This is how it should be, 3 = I am neutral, 4 = I can live with this, and 5 = I dislike it that way. To compare service quality preferences across situations, we conducted a case study as outlined below.

Table 4   Examples of Potential Customer Requirements Based on a Kano Questionnaire Measuring SI and DI

Potential passenger requirements	1	2	3	4	5
1A. How would you feel if your baggage is loaded in to the aircraft according to the flight schedule? **1B**. How would you feel if your baggage is missing or lost?					
2A. How would you feel if an airport authority informed you an accurate baggage conveyer belt when you arrived at the airport terminal? **2B**. How would you feel if inaccurate baggage conveyer belt has been informed when you arrived at the airport terminal?					
3A. How would you feel if the airport authority arranged a special facility, equipment or staff to support your heavy baggage at pre-flight or post-flight? **3B**. How would you feel if the airport authority did not arrange a special facility, equipment, or staff to support your heavy baggage at pre-flight or post-flight?					

Where 1= I like it that way, 2= This is how it should be, 3= I am neutral, 4= I can live with this, 5= I dislike it that way

3.2 The Case Study

Development of a passenger baggage handling system as an airport service can improve passengers' satisfaction in the pre-flight and post-flight phases of air travelling. The case was discussed to describe solving an airline and airport service problem that is due to various problems of passenger baggage handling caused by delayed baggage delivery to the passenger or baggage missing or broken during the pre-flight or post-flight phase. Because providing passengers with the best service quality is part of an airline's and airport's image, service quality may be disrupted when the airport facility or equipment has technical problems or lacks suitable information for passengers. Figure 6 shows the Kano's model problem-solving process that can be used to improve airline and airport service.
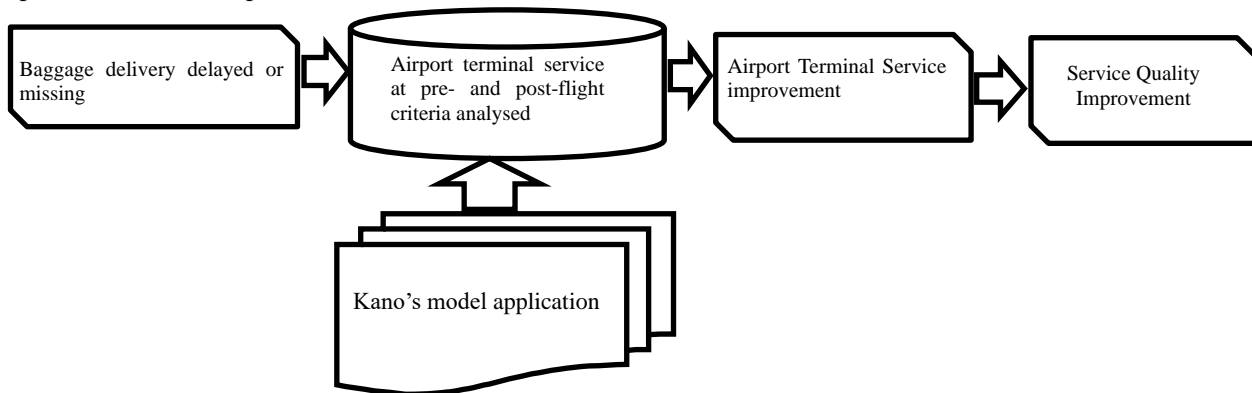
Figure 6   Using Kano's Model to Resolve Airline Image Problems Caused by Technical Problems

Identify and evaluate the problem using Kano's model:

Airline passenger baggage service failure due to system malfunctions will affect passenger satisfaction and perceptions of service. As shown in Table 5, research has shown that airport services such as baggage system malfunctions may cause flight delays or passenger service perceptions. Thus, Kano's attractive process will be applied with the extra service to improve service quality during that phase of flight.

According to Figure 6, using Kano's model to analysed find out the solution to resolve the problem with target to improve airport and airline imagethat are caused by technical problems in the baggage handling process. Kano's model can be used to improve the baggage service process at airport terminals.

Table 5   Airline Passenger Requirement Survey After Baggage Service Problems in the Pre-flight and Post-flight Phases Using Kano's Model

Airline passenger requirement survey in case of baggage service problems						
Airline passenger requirements	Kano's attractive model				Index	
	A	M	O	I	SI	DI
Baggage check-in service measurement criteria						
1. Convenient baggage check-in	27	42	23	8	.50	-.65
2. Quick baggage processing	21	39	21	19	.42	-.60
3. Comfortable check-in area	19	43	21	17	.40	-.64
4. Employee knowledge and courtesy	29	45	25	1	.54	-.70
Boarding service measurement criteria						
1. Comfortable waiting area	37	32	26	5	.63	-.58
2. Prompt response to passengers	35	25	25	15	.60	-.50
3. Facility support for carry-on baggage	62	16	20	2	.82	-.36
4. Accurate baggage information	23	31	37	9	.60	-.68
5. Employees willing to help passengers	31	35	20	4	.69	-.47
6. Passengers' extra baggage weight availability	49	27	20	4	.69	-.47
Baggage and transit service measurement criteria						
1. Quick baggage delivery	21	23	39	17	.60	-.62
2. Lost-and-found service	29	42	21	8	.50	-.62
3. Convenient baggage claim	29	41	23	7	.52	-.64
4. Promptness and accuracy of baggage facility	27	54	12	7	.39	-.66
5. Modernised baggage handling and transferring system	60	18	18	4	.82	-.36

Identify and evaluate the problem using Kano's model: According to Table 6, research found that a preventive analysis in the baggage process should be conducted to identify potential failure points in the baggage service offering during the pre-flight and post-flight phases at the airport terminal. It is difficult to achieve 100% of a baggage service system due to unforeseen malfunction. The airport and airline operators should give prior notice and explanations to the passengers for the temporary unavailability of services to prevent loss of customer loyalty. The baggage service equipment should be regularly inspected, and the mechanical system should be checked periodically to prevent accidental breakdowns. The airport and airline operators should use an alternative procedure in case of equipment system failure to prevent missing baggage, service quality failure, and increased airline operational cost due to extra payment to passengers to cover missing baggage. Passenger baggage system malfunctions will affect passenger satisfaction and perceptions of both the airport's and the airline's service quality.

Table 6   Kano's Model Applied to Improve Airline Service Quality Problems Caused by Technical Problems

Identify problem	Airline service quality improvement
Prior counteraction	Preventative analyses should identify potential failure points of passenger service process.
Periodic action	Airport service equipment inspections should be performed regularly to prevent accidental breakdowns.
Excessive action	Give prior notices and explanations to passengers for the temporary unavailability of services to prevent dissatisfaction and loss of customer loyalty.

4. Discussion and Conclusion

The research was based on an empirical case study of airport terminal service quality. We identified the problem and found that problem solving in airport terminal service quality failure due to service equipment technical problems. We found that passenger baggage handling during the pre-flight and post-flight phases is one problem that affects passenger satisfaction. Problem solving using Kano's attractive model as a guideline to study the criteria could improve service quality and passenger satisfaction. Kano's theory of service improvement was applied to improve the service quality of airport terminals and airline services.

In view of airport terminal serviceability is conducted by the ICAO, IATA regulations and policies. There are many factors that may affect the service quality, such as airport physiology and characteristics, maintenance conditions, air traffic control, weather conditions and airline management business strategies (Liou et al., 2007). According to the case study, airport service quality may impact the aviation industry's image. Kano's model was used to survey and provide a unique way of systematically analysing and improving airport service quality, which can improve the airline's image (Chai et al., 2005). Understanding Kano's attractive model as applied to airport terminal service is a means to attain top-quality service in an airport and the airline business. Analysis shows that in the course of the development of airports, the improvement of their performance and service quality is a hot topic and challenging issue, which is widely considered from various angles and using different methods, such as passenger experiences, assessment of airport performance by means of technical performance indicators, and analysis of the quality of airport services using Kano's methodology.

We conducted research to identify quality problems in airport terminal baggage service by interviewing passengers and employees, facilitating focus groups, and observing airport operation procedures. The criteria from Kano's model were applied as guidelines to survey and measure the service quality. The airport terminal survey was developed according to ICAO and IATA regulations. Problem solving was performed according to the problems that were identified by applying Kano's model to airport terminal services. Therefore, the evaluation resulted in a framework to empower the airport terminal service to improve the aviation industry's image.

The identifying in theory analysis with the assessment criteria that reveal, from different perspectives, the quality of airport services offered to airlines, performance levels, reliability, and other factors that influence airline choice. This analysis resulted in the development of a system of criteria for assessment of the quality of the airport services provided to airlines designed to assess the quality of airport services.

The experts' survey during the focus group activity conducted within the framework of a pilot study established the relative importance of airport service quality assessment criteria in respect to airlines. Based on the analysis of the literature and expert assessment of the significance of criteria, this study proposes a system of criteria designed for assessment of the quality of airport services provided to airport terminal services using Kano's attractive model as well as the service processes provided by airports to airlines.

We found that improving serviceability in the airport terminal service during the pre-flight and post-flight phases is extremely important to aviation industry management. Thus, applying Kano's model to improve airport terminal service quality enables the airport and airline to improve their image.

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